

REMARKS

Applicants respectfully request reconsideration of the present application in view of the foregoing amendments and in view of the reasons that follow.

I. Claim Status

This amendment adds, changes and/or deletes claims in this application. A detailed listing of all claims that are, or were, in the application, irrespective of whether the claim(s) remain under examination in the application, is presented, with an appropriate defined status identifier.

Claims 61 and 77-78 are requested to be cancelled.

Claims 57- 60, 62-64 and 75-76 are currently being amended. Withdrawn method of processing claims 65 and 70 are currently being amended to recite all limitations of article claims 62 and 57, respectively. Upon allowance of product claims, Applicants respectfully request rejoinder of withdrawn method claims of the same or narrower scope as the allowed product claims.

Support for amendments can be found in Paragraph [0061] of the published application, original claims 8 and 10, previously pending claim 61 and Figures 4 and 5. No new matter is added.

After amending the claims as set forth above, claims 57-60 and 62-76 are now pending in this application. Claims 65-74 are withdrawn.

II. Claim Rejections – Claim 57 And Its Dependent Claims

Claims 57-59 are rejected under 35 U.S.C. 102(e) as being anticipated by Mack et al. (U.S. 2003/0224168, hereinafter “Mack”). Claim 60 is rejected under 35 U.S.C. 103(a) as being unpatentable over Mack in view of Piegney et al. (*Carbon*, (39) 2001 505-514, hereinafter “Piegney”). Claim 61 is rejected under 35 U.S.C. 103(a) as being unpatentable over Mack in view of Gao et al. (U.S. 6,361,861, hereinafter “Gao”). Applicants respectfully traverse.

Claim 57 is amended to recite that “the plurality of carbon nanosheets are aligned and stand on their edges roughly vertically to the substrate.” The alignment was previously claimed in claim 61.

The Office Action correctly recognized with respect to claim 61 that Mack fails to teach that a plurality of the nanosheets are aligned. However, the Office Action points out that Gao teaches aligning a plurality of nanstructured carbon materials, and alleges that it would be obvious to a person having ordinary skill in the art at the time of invention to align a plurality of the nanosheets taught by Mack because Gao teaches that doing so allows for their use in flat panel displays. Applicants respectfully disagree.

Mack teaches to create a dispersion of carbon sheets by intercalating ions into carbon layers of graphite followed by sonication to exfoliate the carbon layers of graphite (*see*, Mack, Abstract and Paragraph [0019]). However, Mack is silent regarding assembling the dispersion of the carbon nanosheets to stand on their edges roughly vertically to a substrate.

On the other hand, Gao teaches to grow aligned carbon nanotubes filled with conductive filler on solid substrates by PVD or CVD methods, for example by thermal decomposition of acetylene gas in nitrogen (*see* Gao, Column 1, Lines 10-15 and Lines 40-55).

First, carbon nanotubes of Gao are different composition of matter from carbon nanosheets having a thickness of 2 nanometers or less, as recited in claim 57. Thus, one of ordinary skill of art would not be motivated to produce aligned carbon nanosheets simply because Gao teaches that aligned nanotubes filled with conductive fillers can be used for flat panel displays.

Further, like Mack, Gao is also silent regarding assembling a dispersion of the carbon nanotubes, let alone carbon nanosheets recited in claim 57, to stand on their edges roughly vertically to a substrate. Thus, even if Mack and Gao are combined, one of ordinary art would *not* be enabled to produce a plurality of aligned carbon nanosheets that stand on their edges roughly vertically to a substrate, as recited in claim 57.

In other words, Gao teaches forming a catalyst layer 150 on a substrate 160. The catalyst layer enables the growth of carbon nanotubes. However, neither Gao nor Mack teach or enable forming carbon nanosheets which stand on their edge on the substrate. In other words, if Gao's method was used to form vertical nanostructures, then vertical nanotubes, not nanosheets, would result. Gao does not teach how to form vertical nanosheets.

In contrast, if Mack's sonication method was used, then the nanosheets would not stand on their edge on the substrate. Thus, the combination of Mack and Gao does not enable one of ordinary skill in the art to form nanosheets which stand on their edge on the substrate.

Thus, the combination of Mack and Gao suggests that one of ordinary skill in the art would simply intercalate ions into the multiwall nanotubes of Gao followed by a sonication, which would likely remove the nanotubes of Gao from the substrate resulting a dispersion of nanotubes. However, it would not result in the plurality of aligned carbon nanosheets that stand on their edges roughly vertically to a substrate, as recited in claim 57.

Piegnay is recited for disclosing other features of dependent claims, but fails to cure the deficiencies of Mack and Gao explained above.

Claims 58-60 and 75 depend from claim 57, and thus are considered patentable for at least the same reasons as claim 57.

III. Claim Rejections – Claim 62 And Its Dependent Claims

Claims 62 and 76 are rejected under 35 U.S.C. 103(a) as being unpatentable over Shang et al. (*Chemical Physics Letters* 358 (2002) 187-191, hereinafter "Shang") in view of Peigney. Claims 63 and 64 are rejected under 35 U.S.C. 103(a) as being unpatentable over Shang in view of Peigney and further in view of Mack. Applicants respectfully traverse.

Claim 62 recites a composition comprising a plurality of carbon nanoflakes having a specific surface area between $1000 \text{ m}^2/\text{g}$ and $2600 \text{ m}^2/\text{g}$, wherein the carbon nanoflakes are aligned, freestanding and stand on their edges roughly vertically to a substrate.

Shang teaches carbon nanoflakes deposited on a substrate. However, Shang is silent regarding the specific surface area of the carbon nanoflakes. On the other hand, Peigney is merely a theoretical study of specific surface area of single- and multi-walled carbon nanotubes and of carbon nanotube bundles. As explained above, carbon nanoflakes are a different composition of matter from carbon nanotubes. Thus, the combination of Shang and Peigney still fails to teach the carbon nanoflakes having a specific surface area between 1000 m²/g and 2600 m²/g. In other words, a surface area of a prior art carbon nanotube does not mean that the same surface area will be achieved in a carbon nanoflake.

Furthermore, Shang teaches that carbon nanoflakes are interlaced together to form a layer of carbon nest-like film (*see* Shang, Abstract), explicitly teaching away from the carbon nanoflakes that are aligned and freestanding, as recited in claim 62.

Mack is cited for disclosing other features of dependent claims, but fails to cure the deficiencies of Shang and Peigney.

Claims 63-64 and 76 depend from claim 62, and thus are patentable for at least the same reasons as claim 62.

IV. Conclusion

Applicants believe that the present application is now in condition for allowance. Favorable reconsideration of the application as amended is respectfully requested.


The Examiner is invited to contact the undersigned by telephone if it is felt that a telephone interview would advance the prosecution of the present application.

The Commissioner is hereby authorized to charge any additional fees which may be required regarding this application under 37 C.F.R. §§ 1.16-1.17, or credit any overpayment, to Deposit Account No. 19-0741. Should no proper payment be enclosed herewith, as by a check being in the wrong amount, unsigned, post-dated, otherwise improper or informal or even entirely missing or a credit card payment form being unsigned, providing incorrect information resulting in a rejected credit card transaction, or even entirely missing, the Commissioner is authorized to charge the unpaid amount to Deposit Account No. 19-0741. If

any extensions of time are needed for timely acceptance of papers submitted herewith,
Applicants hereby petition for such extension under 37 C.F.R. §1.136 and authorize payment
of any such extensions fees to Deposit Account No. 19-0741.

Respectfully submitted,

Date 2/5/10

By 

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